

In summarising this portion it is stated that "the main axis of disturbance extends on each side of a line about five miles in length, having a direction north-east and south-west from Wivenhoe to Peldon. Along this axis the greatest intensity was manifested, as shown by the large percentage of dislodged chimneys, dismantled roofs, &c., and more especially by the fracturing of solid masonry." Following this summary there are the complete records from other parts of Essex and all the other counties over which the disturbance extended. Among the former we notice a very full report from Bocking, furnished by Mr. E. B. Knobel, Sec.R.A.S. It is of interest also to observe how widely the shock was felt over London; records are given from every quarter of the town, and we can but feel thankful that the "axis of disturbance" was not nearer home, or the destruction to life and property would have been most disastrous. A glance at the map, giving the general distribution of the shock, shows that the vibrations were felt as far off as Altrincham in Cheshire, at Sidbury in Shropshire, Street in Somersetshire, Exeter, the Isle of Wight, and across the Channel at Boulogne and Ostend.

The next section will be of special interest to geologists. It is headed "The Earthquake in Relation to Geological Structure," and the first portion deals with the effects of the shock upon underground waters. These effects are, briefly, the raising of the water-level in deep wells near the origin, the falling off of the supply to surface wells, and the rendering turbid of the water derived from the Chalk at Canterbury and in surface wells nearer the centre of the disturbance. The records kept by the Underground Water Committee of the British Association have enabled the authors to give a most valuable series of measurements made at Bocking on behalf of this Committee by Mr. D. Radford Sharpe.

One of the most important practical considerations in connection with earthquake damage is the effect of the subsoil and the position of buildings with respect to the general physical features of the district. This branch of the subject is fully dealt with in the present geological section of the Report, and the authors point out that, owing to the circumstance of the shock having originated beneath a district consisting entirely of London Clay and drift deposits, no very definite conclusions can be drawn as to the effects of the superficial geology in determining the distribution of the damage. They incline to the view that the damage was increased in some cases by the situation of buildings at the junction of different formations, where, in accordance with well-known dynamical principles, the earth-wave undergoes reflection and refraction. A considerable amount of evidence is given to show that both in this and other earthquakes there is a tendency for the shock to make itself felt with special distinctness along "free margins, such as coast-lines, river-valleys, and lines of outcrop, because in these cases there is no resistance offered in one direction to the vibrating particles in their outward movements."

In connection with other geological considerations the authors state that their seismic axis corresponds in direction with the coast-line at this part of Essex, and this fact appears to be in harmony with the theory first put forward by Prof. J. P. O'Reilly. Several pages are devoted to a critical discussion of the evidence furnished by

the records from beyond the London Basin, from which it distinctly appears that the shock was spread outwards along the older rocks, owing to the superior "seismic conductivity" of these beds.

In speculating upon the cause of the earthquake the authors display great caution. Having dismissed the view of the shock having been due to volcanic agency they go on to say:—

"The most feasible explanation, in so far as it is safe to hazard any explanation at all, appears to be that of the sudden rupture of deep-seated rocks under a state of strain, the snap and shock accompanying such a fracture being quite competent to produce the effects observed. The precise formation in which this rupture may have occurred cannot even be conjectured; but the great extent of the shock, on the one hand, and on the other the absence of any perceptible change of surface-level, appear to point to a tolerably deep-seated origin."

It is then pointed out as a very significant fact that the axis of the present earthquake corresponds in direction with known faults or other disturbances in the Chalk beneath Essex, Suffolk, and Cambridgeshire, and with that of the well-known Deptford fault.

In the seventh section there are collected a number of miscellaneous observations which could not well find place in the preceding portions of the Report. Mallet's method of determining the "angle of emergence" by the cracks in buildings has been found useless in the present earthquake, and the authors wisely state:—

"We have not thought it advisable to give any calculations of the depth of the origin of the disturbance, being convinced that under the present circumstances such determinations would only give a fictitious semblance of certainty to the results."

A full discussion of the time-records is then given, and the mean velocity of propagation of 9183 feet per second deduced from the most trustworthy. The remainder of this section contains "Observations on Direction," "Personal Experiences of Direction," "Order of Succession of Phenomena," the "Direction as given by Clock-stoppages," and an important sub-section on the twists of chimneys.

The eighth and last section gives a general summary of the whole work. In a postscript, two observations of considerable interest are recorded, the first being the registration of the shock and subsequent earth-tilt at Leeds by a barograph, and the second the displacement of Mr. C. L. Prince's equatorial at the Crowborough Observatory in Sussex. The volume concludes with a short appendix, which relates to the list of British earthquakes.

SYSTEMATIC SMALL FARMING

Systematic Small Farming. By Robert Scott Burn. (London: Crosby Lockwood and Co., 1886.)

THIS volume may be divided into two parts. In the first few chapters the author shows, with considerable clearness, the disadvantages under which small farmers or peasant proprietors are placed. The topic is one which has recently been discussed in connection with legislative projects looming upon the political horizon, and Mr. Scott Burn has contributed towards its elucidation. "While he would be glad to see a limited

extension—and which he believes would for natural reasons, after all, be indeed but limited—of small farming, with true peasants or agricultural labourers as the farmers, we must unhesitatingly deprecate any extension based upon the system we have heard so persistently propounded by certain politicians, through the platform or press, and this we do, if for no other reason than in the true interests of the nation" (p. 98). This sentence gives a fair idea both of the literary style of the author and of the tendency of his teaching. With the general conclusion we agree.

While Mr. Robert Scott Burn is, so to speak, "sound" upon the "impracticalness" of the idea of a great extension of small farms in England as a means of improving our agriculture or the well-being of our population, he sees in the small farm an amusement and healthful occupation for those who can afford the luxury of losing a little money. It is apparently with a view to enabling such persons, if not to make more, to lose less, that the second part of the volume is specially designed. Leaving "the wild and revolutionary scheme," he therefore proceeds leisurely to examine the methods and conduct of the small farmer upon his small farm of some half-dozen acres in extent. Into details it is not for us to follow Mr. Burn. He informs us in the preface that the basis of the present volume is a former one which appeared some years ago under the title of "The Lessons of My Farm." That work "was designed to convey to persons interested especially in the subject of small—or, as they are frequently termed, amateur—farms, a general yet a sufficiently practical notion of what the work of such farms was." On reading through the chapters devoted to his practical instruction of the small farmer we are struck with the evidently large proportion of the "basis."

Bearing the date of 1886, the illustrations, examples, and quotations are chiefly borrowed from sources extending from 1830 to 1860, that is, with the exception of the chapters devoted to *ensilage*. Most farmers would elevate their eyebrows at the suggestion to raise their mangel in seed-beds, and plant them out like cabbages. The result would no doubt be a greatly diminished crop. Yet Mr. Burn says: "I would recommend the reader to try the method." It appears that it was in 1830 that a M. Kœchlin, who cultivates weeded plants, asked why beet-root was not raised upon a seed-bed. But mangel-wurzel is *not* beet, and as well might it be proposed to transplant swedes because they are allied to cabbages as to recommend for mangel what may have been found suitable for beet. This love of the practices of 1830, 1855, 1860, beyond which latter date Mr. Scott Burn rarely ventures except with reference to *ensilage*, is accompanied by a curious ignoring of the newer literature bearing upon the feeding-stall, the dairy, and the field. Mr. Horsfall and Mr. C. Lawrence, long since retired, if not dead; contributions of Dr. Lyon Playfair, long overgrown with mould; Liebig and Anderson, both long since passed away—these are the authorities quoted. On the other hand, Sir John B. Lawes, although once, in an appendix, obscurely mentioned as Mr. J. B. Lawes, is never quoted or cited on any of the numerous subjects handled. In treating of dairy cattle we are instructed from the experience of M. Lejeune of a Belgian agricultural school obtained in the years 1855 and 1856.

At p. 347 we are presented with illustrations of dairy implements and utensils. They consist of three crocks, a milk-strainer, two "butter-sticks" (Scotch hands), and a cream-skimmer. No churn, cheese-tub, curd-breaker, butter-tub, vats, presses, butter-worker, curd-mill, &c., are even mentioned. A cream-raising machine is alluded to, but we are quite at a loss to know what is meant—perhaps a cream-separator. A cream-raising machine strikes us as fantastic. In the present day we are, perhaps, too liable to forget past experiences; but when the results of recent experiments, conducted with modern precision and modern apparatus, lie around us in almost reckless profusion; when the values of foods, the effects of dietaries upon cows and their produce, or in promoting increase in carcass weight, may be seen in the full reports constantly appearing of State Colleges in America, Experimental Stations in Germany, in the Rothamstead and Woburn papers, &c., &c., it seems scarcely necessary to go back to 1855 for examples and results, while at the same time modern work is simply ignored.

OUR BOOK SHELF

North Borneo: Explorations and Adventures on the Equator. By the late Frank Hatton; with a Biographical Sketch and Notes by Joseph Hatton. (London: Sampson Low, 1885.)

MR. FRANK HATTON, whose life and labours form the subject of this volume, was the scientific explorer and mineralogist to the North Borneo Company for the magnificent territory now under its sway. After only eighteen months in the island, he was killed by the accidental discharge of his own rifle on his last journey prior to his return to Europe, on the Segama River, whither he had gone in the course of his duties to search for traces of gold. Short as his period of service had been, he had succeeded in exploring a large part of British North Borneo, and the newness of this region as well as the lack of information about the interior will render the second part of this volume, containing Mr. Hatton's own diaries and official reports, of special interest. He was evidently of the stuff of which explorers are made: he had abundant readiness, resource, patience, energy, and a cheery good humour which helped him through many difficulties with native tribes who are all but unknown even to officials of the Company. His first journey from Sandakan, the capital, was to Sequati, for the purpose of reporting on the resources of the petroleum oil shale there: this was succeeded by an adventurous journey up the Labuk River. After arriving at the upper waters of this great stream he struck across the country to the north to Kudat, carrying on explorations in all directions on the way, including a visit to the great mountain of Borneo, Kina Balu. With Kudat as head-quarters, he spent some months around Marudu Bay, at the extreme north point of Borneo, engaged in mineralogical investigations, and discovered samples of copper and copper pyrites, coal, and other minerals. After a short rest, he again left Sandakan, this time going south to the mouth of one of the greatest—perhaps the greatest—of Bornean rivers, the Kinabatangan, which he ascended to the borders of Province Dent. On the way he made several plucky attempts to penetrate south from the course of this river to that of the Segama, but failed on account of the rainy season, and the swamps created in consequence. On the map the lines marking two gallant attempts, which can now be seen to have been almost crowned with success, stop in districts marked "large swamps." Failing in this way to reach